Ownership Structure and Debt Leverage: Empirical Test of a Trade-Off Hypothesis on French Firms

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Abstract

Debt may help to manage type II corporate agency conflicts because it is easier for controlling shareholders to modify the leverage ratio than to modify their share of capital. A sample of 112 firms listed on the French stock market over the period 1998-2009 is empirically tested. It supports an inverted U-shape relationship between shareholders' ownership and leverage. At low levels of ownership, controlling shareholders use more debt in order to inflate their stake in capital and to resist unfriendly takeovers attempts. When ownership reaches a certain point, controlling shareholders' objectives further converge with those of outside shareholders. Moreover, financial distress will prompt controlling shareholders to reduce the firm's leverage ratio. Empirically, it is shown that the inflection point where the sign of the relationship between ownership and debt changes is around 40%. Debts may help in curbing private appropriation and appears also as a governance variable.

JEL: G3/ G32/G34
Keywords: Corporate Governance, Private Benefits, Controlling Shareholders, Debt Leverage

Ownership Structure and Debt Level: Empirical Test of a Trade-Off Hypothesis on French Firms

INTRODUCTION

Recent empirical studies in corporate governance show the prevalence of firms with a dominant shareholder (La Porta *et al.,* 1997, 1998, 1999; Claessens *et al.,* 2000; Faccio *et al.,* 2002; Paligorova and Xu, 2009). The fundamental agency problem in firms with a dominant shareholder is between controlling shareholders and outside investors. This situation can potentially impact a firm's financing decisions, particularly choices regarding leverage. The capital structure literature has largely addressed the relationship between ownership structure and debt levels for firms with diffused ownership[2]. The results of these studies have been mixed to some extent. Some studies have suggested that debt is positively related to managers' equity ownership (Leland and Pyle, 1977; Stulz, 1988; Harris and Raviv, 1988, Berger et al., 1997), while other empirical studies have argued for a negative relationship between managerial ownership and debt levels (Friend and Lang, 1988). Another line of research has investigated how the separation of cash flow rights and control rights affects capital structure. Namely, it explores the impact of the outside shareholders' expropriation risk on debt levels. Here, debt is seen as an expropriation device similar to control enhancement mechanisms.

Our motivation is different; we investigate the relationship between controlling shareholders' ownership and corporate debt levels. Here also the extent literature shows mixed results. Kim and Sorenson (1986), and Agrawal and Mandelker (1987) for American firms; Friedman et al. (2003) for Asian firms; Boubaker (2007) for French firms; and Holmen et al. (2004) for Swedish firms all find evidence of a positive relationship between debt and control. Considering U.S. firms, Nielsen (2006) empirically documented a trade-off between a levered financial structure and a weak shareholding. These results suggest that debt will help in

expropriation because it gives more power on economic resources. However, the conclusions are not unanimously univocal. Faccio et al. (2003) moderate the former idea. In the United States, debt seems to play an effective, disciplinary role in governance. In Europe, the companies at the bottom of a pyramid, who are seen as more vulnerable, are not particularly indebted. On the other hand, in Asia, the situation is different, with strong pressure on the firms in the pyramid. However, excessive debt leverage exposes the firm to failure, a situation where both public and private earnings for the control group are lost. Holderness et al. (1999) found no relationship and show that managerial stock ownership does not increase with debt leverage. Grullon et al. (2001) for American firms or Brailsford et al. (2002) for Australian firms conclude in favor of a nonlinear complex relation between control and debt, positive at the beginning but turning negative at a certain point of control. For the latter, the inside shareholders will try to avoid a loss of control linked to a risk of financial distress, so they will limit the debt ratio of the controlled firm. Ellul (2008) confirms such a nonlinear relationship in a large sample of family firms over many countries. The category of family firms is a subset of controlled firms with specific features. Many empirical studies underline the importance of control incentives (Anderson et al., 2003, Doukas et al., 2010). Family firms prefer debt financing as a non-dilutive security. This paper proposes an empirical study of a self-regulated relationship between debt levels and controlling shareholders' capital ownership. Our hypothesis is that this relationship is non-linear. Capital structure decisions depend on the trade-off between the non-dilution entrenchment needs of controlling shareholders and their goal of reducing firm risk. Thus, the relation between controlling shareholders' ownership and the firm's debt levels may be complex and may have an inverted-U shape. We use a sample of firms listed in the French stock market from the SBF 250 index over the period 1998-2009 in order to explore this relationship.

The French context provides an especially good platform to conduct our research for several reasons. First, as documented by La Porta et al. (1999), the corporate governance system in France is typified by a high concentration of ownership, family-controlled firms, the presence of family members in management, the relative lack of good protection of outside shareholders, and an inefficient law enforcement system. French firms rely more heavily on bank financing and their internal funding is decreasing. Domestic institutional environment is seen as important to explain the international differences in financing decision (Alves and Ferreira, 2011; Cheng and Shui, 2007). By considering only one country we neutralize this effect.

Our results show that controlling shareholders' ownership affects a firm's debt level in different ways and support the hypothesis of a trade-off relationship. In particular, we evidence to an inverted U-shaped relationship between the ownership stake of the controlling shareholders and debt levels. Thus, debt first increases (non-dilution entrenchment effect) and then decreases (risk reduction and incentive effect) with the cash flow rights of the controlling shareholders, since the structure of incentives changes as their holding increases. The non-linear relationship confirms that a firm's financing mix depends not only on firm-specific factors but also on the cash-flow rights of the controlling shareholders. We are in line with Ellul (2008)'s results in a recent similar study, although it was limited to family firms. In a study related to French firms, Boubaker (2007) finds a similar non-linear relationship between excess control rights and debt levels. Unlike Boubaker's (2007) work, our paper examines an alternative aspect of ownership structure, namely the dominant shareholders' ownership stake and its impact on the firm's debt ratio. Our paper is also different from recent studies that have investigated the impact of a pyramid ownership structure on a firm's capital structure (Paligorova and Xu, 2009; Ellul, 2008; King and Santor, 2008; Manos et al., 2007; Bianco and Nicodono, 2006, Faccio and Lang, 2002). These studies have shown that debt facilitates the

expropriation of outside shareholders by controlling shareholders who control firms through pyramids. However, in this article, we only consider the dominant shareholder ownership of cash flow rights and not the separation between ownership and control, and we show that more cash flow rights in the hands of the largest shareholder lead to lower leverage. Finally, our paper complements recent studies on the endogeneity of ownership structure and addresses the endogeneity problem between controlling shareholders' ownership and firm debt levels. From a methodological point of view only few articles implement a simultaneous equation system to take into account the reverse causality problem between controlling ownership and leverage (Bhattacharya and Graham, 2009; Seifert et al., 2005). In particular, the issue is whether dominant shareholder ownership leads to a low debt level, or whether the limited use of debt prompts controlling shareholders to maintain their holdings. Thus, debt and large shareholder ownership can be seen either as substitute or complementary mechanisms. Our empirical results show also an inverse causal relationship from debt to dominant shareholder ownership, which suggests that debt may serve as a substitute for capital ownership by the controlling shareholders. In a context of dominant control ownership we show that the ownership stake is of utmost importance and this decision should interact with leverage.

The remainder of this paper is organized as follows. A first Section presents the hypothesis, the data and the methodology. The next Section presents the empirical results on French firm sample. Another Section addresses the endogeneity problem. A conclusion follows.

1-HYPOTHESIS, DATA AND METHODOLOGY

1.1 Hypothesis

Referring simultaneously to the entrenchment effect and to the incentive effect, we state that the relation between ownership structure and leverage varies according to the level of controlling shareholders' equity ownership. At low levels of controlling ownership, in contrast

to equity financing, debt allows the controlling shareholders to dominate more resources without diluting their control stake. However, at high levels of controlling shareholders' ownership, the optimal debt level is reduced. As controlling shareholders' ownership increases, their interests became more aligned with those of outside shareholders, and thus debt is not used as a means of expropriating outside shareholders. In this context, controlling shareholders also prefer to use less debt to limit their default risk. These two competing effects suggest testing empirically the possibility of a non-linear relationship between the level of corporate debt and controlling shareholders' ownership. Formally, we test the following hypothesis: *leverage first increases as the controlling shareholders' ownership increases, then, over a certain critical level, it decreases as the controlling shareholders' ownership increases.*

1.2 Sample and Data

Our sample set consisted of firms listed on the French stock market over the period 1998-2009. These firms belong to the SBF 250 index. We exclude the largest French groups belonging to the top CAC 40 Index. Financial companies were excluded from the sample because these companies have to comply with very stringent legal requirements. Those firms that were subject to mergers or acquisitions, or those that were not listed on the stock exchange for a given year, were also eliminated. We also removed firms with negative book equity values (Kremp et al., 1999; Lins et al., 2002). Our sample was trimmed by applying a methodology similar to that of Kremp et al. (1999). This yielded 1344 firm-year observations on 112 firms for the period 1998 through 2009. Firm-level accounting data and market equity values data were extracted from the Thomson Financial database. A lot of firm-year observations were missing because of mergers, or delisting along the period, or because of data unavailability. We collected the ownership structure and voting rights data from Thomson Financial database for the former and directly from the financial reports for the latter.

1.3 Measuring Controlling Shareholders' Ownership and Leverage.

Three different measures of leverage were considered using either book value or market value. Consistent with Antoniou et al. (2008), we calculated book leverage, defined as the ratio of book value of total debt divided by total assets (*DT_TA*). We also considered an alternative definition of leverage measured by the total debt to book value of invested capital, i.e equity and total debt (*DT_CE*). The third measure is the market leverage measured as the ratio of book value of total debt to the market value of equity plus the book value of total debt (*DT_CMV*). Data limitations confined us to measure debt based only on the book value.

Controlling shareholders' ownership is measured using the same methodology used by La Porta et al. (1999). Thus, we collected direct ownership and control rights for the largest shareholder. We distinguished between private shareholders, financial institutions, corporations, and a state. We looked at the ultimate controlling shareholder when the largest shareholder is a state or family members with the same surname (Maury and Pajuste, 2002). When the largest shareholder was a financial institution or a corporation, we then identified their owners, the owners of these owners, and so on. To measure the ownership stake of the ultimate controlling shareholders, we took the product of the cash flow stake along the control chain. We define the control stake by using the weakest voting stake in the control path. Then, following Le Maux (2002), we split up our sample according to whether firms are dominated by controlling minority shareholder, dominated by a controlling majority shareholder, or widely held. A controlling majority shareholder owns 40% or more of voting rights alone or with other shareholders (family members or other shareholders involved in shareholder agreements)[3]. A controlling minority shareholder holds less than 40% of voting rights but dominates the board with members who are affiliated with them. Board members affiliated with a firm's controlling shareholders are managers, family members, banks, insurance companies, employees, state

affiliates, and other shareholders involved with the controlling shareholders in a shareholder agreement. Thus, the controlling shareholders may be comprised of several allies in a controlling coalition. A firm is regarded as being widely held when it is not dominated either by a controlling majority shareholder or by a controlling minority shareholder. According to this methodology, we calculate the controlling shareholders' ownership (*PERC_CAP*) by the proportion of cash flow rights held by the controlling shareholders.

1.4 Control variables

We also integrate conventional control variables that are usually considered in financial literature as influencing the firm's capital structure. These variables include growth opportunities, firm size, the nature of assets, profitability, operational risk, non-debt tax shields, and industry classification. In line with Rajan and Zingales (1995), we use the market-to-book ratio (*MTB*) to proxy for growth opportunities. Titman (1984), Bradley et al. (1984) and Titman and Wessels (1988) found a negative relation between leverage and other proxies for growth opportunities. Myers' (1977) underinvestment problem suggests a negative relationship between growth and debt. We measured firm size using the logarithm of total assets (*LOGTA*) (Faccio et al., 2002). Rajan and Zingales (1995) suggested that firm size may proxy for the probability of bankruptcy, which is high in the case of small firms. Several empirical studies have found ambiguous results on the relationship between leverage and firm size (Kester, 1986; Kim and Sorensen, 1986; Hoshi et al., 1990; Rajan and Zingales, 1995).

We used the ratio of tangible assets to total assets for the tangibility attribute (*TANGIBLE_TA*) (Kremp et al., 1999). Rajan and Zingales (1995) asserted that tangible assets can be pledged as collateral for loans and can therefore reduce debt agency costs. Myers (1977) suggested that the underinvestment problem due to debt financing is weaker for firms with more tangible assets. We then expect a positive relation between leverage and tangible assets.

The proportion of intangibles goods identified in the balance sheets is a proxy for the importance of non-tangibles assets in the firm. This covers assets such as know-how or R&D. It may justify the use of equity capital because they are not collateral. To take it into account, we use the *INTAGIBLE_TA* variable.

Firm profitability is measured by the ratio of earnings (before interest, taxes, and depreciation) to total assets (*EBITDA_TA*) (Fontaine et al., 1996). We also use the earnings ratio after depreciation and amortization (*EBIT_TA*). Myers and Majluf (1984) suggested that more profitable firms use less debt because they have sufficient internal funds. Several empirical studies have found a negative relationship between profitability and leverage (Friend and Lang, 1988). Another possible explanatory variable is net income volatility. This measure is used in a number of empirical papers (Titman and Wessels, 1988; Friend and Lang, 1988). An increase in income volatility is considered a serious threat for creditors (Ferri and Jones, 1979; Bradley et al., 1984; Mehran, 1992). Income volatility should then be negatively related to leverage. We calculate income volatility by the standard deviation of a firm's accounting profitability. We use the previous 4 years when estimating standard deviation. This yields the two variables *RISK_EBI*T and *RISK_EBITDA*, according to the before or after depreciation measure of profit.

The *NDTS* variable was used to capture the non-debt tax shields argument put forward by DeAngelo and Masulis (1980). They stated that firms with a high level of non-debt tax shields are expected to receive lower tax benefits associated with leverage and hence will less use debt financing. Many empirical studies have corroborated the view that non-debt tax shields are negatively associated with leverage (Wald, 1999; Chaplinsky et al., 1993; Brailsford et al., 2002). We calculate the *NDTS* variable as the ratio of annual depreciation scaled by total assets. The industry feature is also seen as important in explaining corporate leverage. Firms belonging to the same industry face similar market conditions and have the same risk characteristics (Scott

and Martin, 1975; Ferri and Jones, 1979). Titman and Wessels (1988) suggested that industrial companies use less debt because they are exposed to high liquidation costs. Based on the FTSE classification, we created dummy variables to control for the effect of sector classification on the level of debt ratios. We used four dummy variables to control whether the company belongs to industry, consumer goods, services, or new technologies sectors. Annex 1 will present the definition of the variables used in the test.

1.5 Methodology.

According to the model, we tested the hypothesis of a non-linear relationship between leverage ratios and controlling shareholders' ownership. We used panel data regression analysis. In such a framework, the heterogeneity of firms was captured by including firm-specific effects, which may be either random or fixed. A random-effects model assumes independence between error terms and explanatory variables. The Hausman test allows validating the exogeneity of the firm-specific effect vis-à-vis the dependent variables (Hausman, 1978). If the two null hypotheses are rejected, then a fixed effect modeling will be retained.

First, to test the impact of controlling shareholders' ownership on a firm's leverage ratios using the whole sample:

$$DT(k)_{it} = \beta_0 + \beta_1 PER\_CAP_{it} + \beta_2 MTB_{it} + \beta_3 LOGTA_{it} + \beta_4 FIXED\_ASS\_TA_{it} + \beta_5 EBITDA\_TA_{it} + \beta_6 NDTS_{it} + \beta_7 RISK\_EBITDA_{it} + \beta_8 (\text{ sector dummy variables }_{it}) + \varepsilon_{it,} \quad (1)$$

where i denotes the cross-sections and t denotes the time period with i= 1… 112 and t= 1... 12. We have yearly observations from 1998 to 2009. *DT(k)* represents different leverage measures (*DT_TA, DT_CE, DT_CMV*) with k= 1, 2 and 3. Finally, ε_{it} is the normal error term. The same model (1) is also estimated on the two sub-samples of (i) firms controlled by majority

shareholders and (ii) firms controlled by minority shareholders. Then, we investigated the non-linear relationship between controlling shareholders' ownership and the firm's debt levels. Therefore, controlling shareholders' ownership and its squared value are included into regressions, together with control variables:

$$DT(k)_{it} = \beta_0 + \beta_1 PER\_CAP_{it} + \beta_2 PER\_CAPSQ_{it} + \beta_3 MTB_{it} + \beta_4 LOGTA_{it} + \beta_5 FIXED\_ASS\_TA_{it} + \beta_6 EBITDA\_TA_{it} + \beta_7 NDTS_{it} + \beta_8 RISK\_EBITDA_{it} + \beta_9 (\text{sector dummy variables}_{it}) + \varepsilon_{it,} \quad (2)$$

The square of $PERC\_CAP_{it}$ is used to test for the quadratic form between debt levels and controlling shareholders' ownership. A negative sign on $PERC\_CAPSQ_{it}$ will highlight the existence of a maximum point, given that $PERC\_CAP_{it}$ and $DT(k)_{it}$ must be non-negative by construction (Brailsford et al., 2002). Thus, we expect a positive sign on $PERC\_CAP_{it}$.

2-EMPIRICAL RESULTS

2.1 Descriptive Statistics

Table 1 shows the descriptive statistics for the sample firms. Panel A shows the percentage of firms with controlling shareholders and Panel B reports the identity of the controlling shareholders. Interestingly, we find that 62.1% of firms are dominated by the controlling majority shareholder, and 19.5% of firms are dominated by a controlling minority shareholder, at the 40% cut-off level. Only 10.9% of firm-year observations belong to widely held firms. This result is in line with Boubaker's (2007) findings for French sample firms. Paligorova and Xu (2009) also documented that among sampled firms in G7 countries, the country with the lowest percentage of widely held firms is France. Firms dominated by controlling majority shareholders are strongly present in our sample. Panel B of Table 1 shows

that family control represents 44% of the firms. Another frequent controlling shareholders category is ownership by corporations, which corresponds to 25% of the total number of observations. The other ownership categories are governments (2%) and financial institution (3%) ownership. Therefore, Panel B shows the predominance of family control in the French Midcap context. This corroborates the findings of Boubaker (2007), Faccio and Lang (2002), and La Porta *et al.* (1999). Then, we considered firms with a second-largest shareholder holding at least 10% of voting rights who is unaffiliated with the controlling shareholders (neither by shareholder agreements nor by family ties). Many studies have highlighted the important role of a second blockholder (Pagano and Roell, 1998; Bolton and Von Thadden, 1998; Gomes and Novaes, 2001; Bennedsen and Wolfenzon, 2000). A second controlling shareholder will limit the opportunistic behavior of controlling shareholders and therefore curb the extraction of private benefits of control. Lehman and Weigand (2000) showed that the presence of a second shareholder positively affects the profitability of German listed companies. For European firms, Faccio and al. (2003) confirmed that the expropriation of minority shareholders is limited when controlling shareholders are monitored by a second-largest shareholder. Panel C of Table 1 shows that firms dominated by controlling shareholders without a second-largest shareholder (at a 10% cutoff level) represent 78% of the sample firms. This result confirms the findings of Boubaker (2007), La Porta et al. (1999), and Faccio and Lang (2002) for French firms. Finally, Panel D of Table 1 describes the industry distribution of our sample firms using *FTSE Global Classification System*, which was adopted by the Paris stock exchange (Euronext Paris) on January 1, 2002. Industries in the sample included services, wholesale and retail trade, manufacturing, and communication. Most of the firms in the sample are in services (about 34%), followed by manufacturing industry (24%), consumer goods and trade (about 23%) and information technologies (about 20%). Thus, different sectors are well represented in our sample firms. Globally, Table 1 shows that for French listed firms, (i) controlling majority

shareholders are predominant, (ii) family control of firms appears to be common, and (iii) the monitoring role of the second-largest shareholder is limited.

INSERT TABLE 1 HERE

Table 2 reports descriptive statistics of the cash flow rights and voting rights of the controlling group, as well as the wedge ratio measured by the ratio of the cash flow rights to the voting rights of the largest shareholder. We document that, on average, the controlling shareholders have 51.5% of the cash flow rights and 61.1% of the control rights (Panel A). Thus, the controlling shareholders own a significant fraction of the cash flow rights, and voting ownership is higher than cash flow ownership. As shown by Boubaker (2007) and Faccio and Lang (2002), our results indicate that ownership and control are highly concentrated in France. It can be seen that the controlling shareholders' average ratio of cash flow to voting rights is 89.9%. According to Faccio and Lang (2002)'s study examining Western European countries, the separation of ownership and control is highest in France. Various devices are used by controlling shareholders, such as pyramids, cross-holding, and dual class shares, to create discrepancies between ownership and control rights. In particular, pyramids are typical mechanisms of control in France (Boubaker, 2007) and in many other countries (Ellul, 2008). Thus, controlling shareholders are able to dominate firms while owning a small fraction of their capital equity. Our sample covers a large scale of capital stake held by a controlling/not controlling shareholder along the 0 to 100% values (see panel B).

INSERT TABLE 2 HERE

Leverage measures for the entire sample are analyzed according the stake of equity held by a controlling shareholder. For the full sample, the debt-to-assets ratio (*DT_TA*) shows a

mean value of 22.0%. The average value of the leverage compared to the book value of employed capital (*DT_CE*) is 36.7%. The average value of the market leverage value (*DT_CMV*) is 27.2%. Moreover, the mean size of the sample firms, measured by the logarithm of total assets, is 2.88. The mean profitability (*EBIT_TA*) of the sample firms is 7.0% of total assets. The average scaled value of tangible fixed assets is 19.7% and the mean ratio of intangible assets is roughly equivalent (19.9%). The standard deviation of the profitability, which measures the firm's risk, is around 3.5%, either looking at *EBITDA* or *EBIT*. On average, non-debt tax shields account for 4.9% of total assets. Descriptive statistics for the two sub-samples of firms give also interesting features. They outline that firms dominated by controlling majority shareholders have, on average, lower leverage, whether measured in book value or in market value, than firms dominated by controlling minority shareholders. Moreover, we find that controlling majority shareholders hold, on average more than 60% of cash flow rights. On the other hand, the controlling minority shareholders hold, on average, no more than 30% of cash flow rights to influence the firm's decisions. This result suggests different ownership and control structures as proposed by Bebchuk et al. (2000). In a controlling majority structure, the controlling shareholders usually hold a large fraction of cash flow rights. Thus, their interests are more aligned with those of outside shareholders (Jensen and Meckling, 1976). The rationale of a controlling minority permits controlling shareholders to dominate a firm's decisions while holding a smaller capital stake. Hence, they have the incentive to extract valuable private benefits of control (La Porta and al., 1999). Different tests of differences between firms dominated by controlling majority shareholders and firms controlled by minority shareholders were performed (see Table3). With respect to book and market values of leverage, univariate tests reveal that the difference in debt ratios between the two types of firm control is not significant at conventional confidence levels. This finding suggests that firms dominated by controlling minority shareholders do not appear to use debt differently than their counterparts.

Considering now the sub-samples of family-controlled firms and corporate-controlled firms we show a significant difference in their debt leverage. Family-controlled firms will significantly use less debt than corporate-controlled firms (see Table 3). This underlines a specificity for family firms identified by others (King and Santor, 2008; Ellul, 2008; Doukas et al. 2010)

INSERT HERE TABLE 3

In Table 4 we examine the firm leverage as controlling shareholders' ownership increases. The relationship between debt leverage and the ownership stake of controlling shareholders evidence some inverted-Ushape. Thus, controlling shareholders' ownership exhibits a nonlinear pattern with leverage, particularly if we consider *DT_CE* and *DR_CMV* variables. Debt ratio measured in book value increases as controlling shareholders' ownership increases. However, after reaching a maximum around the 50% stake, debt begins to decrease as controlling shareholders' ownership increases. We find no readily apparent relation between controlling shareholders' ownership and debt ratio measured using total assets (*DT_TA*).

INSERT TABLE 4 HERE

2.2 Multivariate Analysis

A correlation analysis of the independent variables was first performed. To check whether variables are collinear, we used a VIF test. The results of our VIF tests are considerably lower than 3. Thus, multicollinearity among the independent variables should not be seen as a problem. We use panel regression only with individual effect and no time effect. A preliminary analysis of variance shows non-significant time effect either looking at the leverage or the ownership stake variable. It is known that these variables are generally stable through

time. When performing the panel analysis we use both random and fixed firm effects. Fixed firm effect are redundant with the dummy sector variables. This is why we performeing the Hausman test we compare model (1) without using the sector dummies. In every case the random firm effect is selected[4].

Controlling Shareholders' Ownership and Leverage.

First, we explored the existence of a linear relation between firm debt level and controlling shareholders' ownership for the whole sample. Table 5 presents the regression results that link cash flow rights in the hands of the controlling shareholders with book and market measures of leverage. The coefficient on the cash flow rights of the controlling shareholders (PER_CAP) is negative and not significant for the M1, M2, and M3 regressions. These results does not seem to support the view that higher debt levels may lead to default and thus that controlling shareholders are more likely to use less debt as their ownership share increases. Control variables are largely significant with the expected sign: higher size means higher leverage, large collateral helps debt, strong tax shield facility also favors leverage. However the sign of the MTB variable is not clear and higher operational risk does not seem to influence the level of leverage.

INSERT HERE TABLE 5

Next, we investigated the effects of the cash flow rights of the controlling shareholders on a corporate capital structure by splitting up the sample according to whether firms are dominated by controlling majority shareholders[5] (M4, M5, M6) or by controlling minority shareholders (M7, M8, M9). Table 6 presents the results of our tests. For firms dominated by controlling minority shareholders, the coefficients of *PERC_CAP* are negative but insignificant. However,

for firms dominated by controlling majority shareholders, the coefficients of *PERC_CAP* are negative and significant. This result suggests that when controlling shareholders hold a majority ownership stake, the relation between firm leverage and ownership is negative and significant. A potential explanation for the result is that controlling shareholders owning a large part of a firm's capital are exposed to a high risk level due to their undiversified financial investment. Therefore, they choose to limit the firm's risk by reducing the use of debt. Higher debt ratios are more likely to lead to default, so controlling majority shareholders are less prone to using debt financing to reduce the risk of losing their wealth in the case of bankruptcy. On the other hand, this finding is also consistent with the positive incentive effects associated with cash flow ownership by controlling shareholders (La Porta et al., 2002). Nevertheless, for firms dominated by controlling minority shareholders, the relationship is not significant. Thus, the positive incentive effect linked to increased cash flow rights of the largest shareholder is less relevant for firms with controlling minority shareholders. Indeed, in contrast to dominant majority shareholders, controlling minority shareholders are motivated to expropriate outside shareholders, as they bear only a small fraction of losses but reap all of the private benefits of control (Cronqvist and Nilsson, 2003). For the two sub-samples of firms, the coefficients on control variables are significant overall and have the expected signs (except for the coefficients of the firm risk and growth opportunities variables). It is worth noticing from Table 6 that conclusions are different depending on whether we consider firms dominated by controlling minority shareholders or by controlling majority shareholders. Because of these conflicting results, we need to introduce a non-linear relationship between debt level and controlling shareholders' ownership.

INSERT HERE TABLE 6

Evidence of a Non-Linear Relationship.

Our univariate analysis suggests that the relation between leverage and controlling shareholders' ownership is potentially non-monotonic. Thus, we examined the possibility of a non-linear relationship between leverage ratios and controlling shareholders' ownership. Table 7 presents the results of models where debt ratios are regressed against controlling shareholders' ownership, the square of controlling shareholders' ownership, and control variables. (M10, M11, M12). The coefficients of *PERC_CAP* and *PERC_CAPSQ* variables present the expected signs and are statistically strongly significant. The coefficient of PERC_CAP is positive and that of *PERC_CAPSQ* is negative. These negative coefficients highlight a nonlinear relation between leverage and controlling shareholders' ownership. The sign of *PERC_CAP*, which was not significant in the linear form, turns now significant when we introduce *PERC_CAPSQ* into the regressions. This result suggests that debt level increases with controlling shareholders' ownership when they hold a small proportion of a firm's capital. The negative value of *PERC_CAPSQ* shows that this relation changes between high and low levels of capital ownership. Thus, debt increases as controlling shareholders' ownership increases, then, after a certain critical level, debt decreases with the percentage of capital held by controlling shareholders. When the level of their ownership is low, the controlling shareholders use leverage for entrenchment motives (Ellul, 2008). Thus, instead of outside equity finance, controlling shareholders choose debt financing due to its non-dilutive entrenchment effect. This effect is particularly strong when controlling shareholders hold a small fraction of cash flow rights but have significant control rights. However, when the cash flow rights of the controlling shareholders are high, the dominant shareholder would like to reduce debt usage in order to limit the risk of financial distress that may lead to the loss of their wealth, which is heavily invested in the controlled firm (Friend and Lang, 1988). In addition, this result is consistent with the incentive effects of the cash flow rights of the controlling

shareholders documented by La Porta et al. (2002). They argue that the positive incentive effects increase with the share of cash flow rights in the hands of the largest shareholder. As controlling shareholders' ownership increases, he has fewer incentives to undertake costly expropriation activities since he internalizes the costs of such actions. Thus, controlling shareholders with a large share of cash flow rights are less likely to rely on debt financing to expropriate outside shareholders[6]. The empirical results confirm our hypothesis that states that the relation between leverage and controlling shareholders' ownership is non-linear. We find that the relative levels of importance of the incentive effect, the risk-reduction effect, and the entrenchment effect balance at a given point which is the maximum of the inverted U-shape curve. Controlling shareholders with a small stake (less than 40%) use more debt for entrenchment purposes. Thus, the entrenchment effect sets and dominates, resulting in severe agency problems between controlling shareholders and outside shareholders. With significant power and influence while holding a low stake of capital, controlling minority shareholders are able to extract important private benefits of control at the expense of non-controlling shareholders. Then, above a certain level of ownership (more than 40 to 50%), dominant shareholders have less incentive to expropriate outside shareholders and to engage in non-maximizing behavior due to the convergence between controlling shareholders' and outside investors' interests. As a result, the controlling majority shareholders are less prone to use debt in order to entrench themselves further. They are more interested in value maximization rather than in expropriating minority shareholders. Furthermore, because a high level of debt financing increases the risk of bankruptcy, controlling shareholders holding a significant fraction of a firm's capital avoid increasing debt in order to prevent financial distress because such distress could lead to a loss of their wealth, which is highly invested in the firm they control. Controlling majority shareholders fear the transfer of control after debt default; as a result, they prefer to moderate indebtedness.

INSERT TABLE 7 HERE

The inflection point of the quadratic relation is obtained by evaluating the first derivative and setting it equal to zero (Brailsford et al., 2002; Anderson and Reeb, 2003). The estimates of the turning points are in th e40 to 50% ownership range. Therefore, for French firms, debt decreases with the controlling shareholders' ownership when they hold more than 40% of the firm's equity. Globally, this result suggests that the debt is positively linked to the controlling shareholders' ownership when they generally hold less than 40% of a firm's cash flow rights. According to our definition of controlling shareholders' categories, our results show that firms dominated by controlling minority shareholders are associated with high debt levels relative to firms with controlling majority shareholders.

Turning to the control variables, we find that the most of them have statistically significant explanatory power and that their signs are consistent with predictions. The *NDTS* variable, which proxies for a non-debt tax shield, has a positive and significant coefficient. Higher profitability is associated with a lower leverage level. This finding is consistent with the pecking-order hypothesis of Myers and Majluf (1984) and the empirical results of Titman and Wessels (1988), Friend and Lang, (1988) and Wald (1995). The coefficient of the firm risk variable is not significant. The result does not support the view that firms with higher earnings volatility use less debt due to higher bankruptcy risks. The estimated coefficient of firm size is positive and statistically significant. This is consistent with the argument that states that firm size serves as an inverse proxy for the probability of bankruptcy, which implies that larger firms should be more highly levered. The positive impact of size on leverage is consistent with the results of many empirical studies (Rajan and Zingales, 1995; Booth *et al*., 2001; Frank and Goyal, 2002). The coefficient of the tangible fixed asset variable is positive and significant. Thus, firms use tangible assets as collateral when negotiating borrowing. This is consistent with

the findings of Zingales (1995); Kremp *et al*. (1999); Frank and Goyal (2002). The coefficient on the *MTB* variable, which proxies for growth opportunities, is negative in models M10 and M11 and significant. Therefore, firms with growth opportunities use less debt financing (Bradley et al., 1984; Titman and Wessel, 1988). However it is negative in the estimates of model M12

3-ENDOGENEITY AND ROBUSTNESS

3.1 Endogeneity between Controlling Shareholders' Ownership and Debt Financing

Our previous empirical analysis explores the impact of controlling shareholders' ownership on debt levels and considers dominant shareholder ownership to be exogenous. Demstez (1983) argued that the ownership structure is an endogenous variable determined by the decisions taken by shareholders and transactions on the stock market. Several studies focusing on the relationship between ownership structure and performance highlight the endogeneity of a firm's ownership structure. Our above results ignore a possible interaction between large shareholder ownership and debt financing. Ownership structure may not affect the firm's leverage, but it can be affected by it. In particular, the issue is whether controlling shareholders' ownership leads to a low debt level or whether low debt levels prompt families to maintain their holdings.

A large body of literature finds a positive or negative impact of ownership structure on a firm's debt levels. However, these studies overlook the inverse causality effect of capital structure on ownership structure. Ignoring this reverse causality may lead to a simultaneity bias. Debt level can be a determinant of controlling shareholders' ownership. According to Jensen and Meckling (1976), debt financing reduces the use of external equity capital, thereby increasing the level of managerial ownership. Debt may also negatively affect dominant shareholder ownership. High indebtedness increases the bankruptcy risk. This may constrain

large shareholders to reduce their holding in order to limit losses of their wealth in the case of bankruptcy. Debt and controlling shareholders' ownership are somehow related in different ways. Thus, whether these mechanisms are substitute or complementary is ultimately an empirical question.

Here, we model dominant shareholder ownership and leverage as simultaneously determined. Therefore, we estimate a system of simultaneous equations highlighting the interaction between debt leverage and controlling shareholders' ownership (Seifert et al. 2005; Bhattacharya and Graham, 2009). The simultaneous equations model is defined by equations (3)-(4), in which controlling shareholders' ownership *(PERC_CAP)* and leverage (*DT(k)*) are endogenous variables. The order and the rank conditions were satisfied; therefore, the equation system was identified.

$$DT(k)_{it} = \beta_0 + \beta_1 PER\_CAP_{it} + \beta_2 PER\_CAPSQ_{it} + \beta_3 MTB_{it} + \beta_4 LOGTA_{it} + \beta_5 FIXED\_ASS\_TA_{it} + \beta_6 EBITDA\_TA_{it} + \beta_7 NDTS_{it} + \beta_8 RISK\_EBITDA_{it} + \beta_9 (sector\ dummy\ variables_{it}) + \varepsilon_{it,} \quad (3)$$

$$PERC\_CAP_{it} = \alpha_0 + \alpha_1 DT(k)_{it} + \alpha_2 MTB_{it} + \alpha_3 LOGTA_{it} + \alpha_4 INTANGIBLE\_TA_{it} + \alpha_5 RISK\_EBIT_{it} \alpha_6 MAT\_DEBT_{it} + \alpha_7 C\_FAM_{it} + \alpha_8 (sector\ dummies)_{it} + \nu_{it} \quad (4)$$

Equation (3) has been analyzed above. Equation (4) describes a reverse causality in the relationship between leverage and ownership structure; here, controlling shareholders' ownership is treated as a dependant variable. Like most of the previous papers related to ownership structure, we include operational risk (*RISK_EBIT*), debt, firm size (*LOGTA*), and research and development (*INTANGIBLE_TA*) as determinants of ownership structure. We expect a negative relationship between firm size and controlling shareholders' ownership (Demsetz and Lehn, 1985). Indeed, large firms tend to issue more shares than do smaller ones. We predict dominant shareholder ownership to be a negative function of risk. Indeed, high levels of risk may lead controlling shareholders to diversify their portfolios. Mahrt-Smith (2005) suggested that firms that need to invest for the long term should have more dispersed

ownership. Research and development expenses and intangible assets show the presence of long-term firm investment, which is negatively related to ownership structure. Ellul (2008) argued that various owner categories could impact a firm's financing decisions in different ways. In particular, family controlling shareholders are more likely to be concerned with maintaining a high level of control than institutional blockholders are. In this regard, family firms will rely heavily on debt to maintain control of their firms. Therefore, we investigate the specificity of family firms through a dummy variable C_FAM.

Preliminary estimates of univariate equation (4) show that debt variable is non-significant to explain the percentage of capital held by the controlling shareholder. The estimates of equation (4) in a simultaneous panel system suggest that dominant shareholders are more likely to reduce their share of cash flow rights when debt financing is increased (see Table 8). A high level of debt increases the probability of default, which may lead the controlling shareholders to lower their ownership stake. This inverse causal relation from debt to controlling shareholders' ownership also suggests that debt may serve as a substitute mechanism for dominant shareholder ownership. Lower cash flow rights held by controlling shareholders increase their willingness to expropriate outside shareholders. Indeed, this exacerbates the conflict between controlling shareholders and outside investors. Debt financing appears as a means of enhancing dominant shareholder control and thus enables dominant shareholders to further entrench themselves (Ellul, 2008).

Among the exogenous variables in controlling shareholders' ownership equation, Table 8 shows that size is negatively and significantly related to dominant shareholder ownership. Controlling shareholders reduce their share of cash flow rights when the controlled firm becomes larger. This result suggests significant ownership dispersion for large firms. Our findings are in line with those of Demsetz and Lehn (1985), Crespi and Cladera (1998), and Harvey et al. (2004). Furthermore, the coefficient on the risk variable is negatively and weakly

linked to the percentage of equity held by the controlling shareholders. This result indicates that dominant shareholders limit their capital ownership when the risk is high. Indeed, they prefer to hold a diversified portfolio to mitigate the loss of their wealth when financial distress occurs. The coefficient on the *R&D* and intangible variable has a negative and significant impact on the cash flow rights of controlling shareholders. Our result is consistent with the Mahrt-Smith (2005) argument that the share of cash flow rights is reduced when the firm has long-term investments. This may lead managers to reduce their opportunistic behavior in order to protect their future rents.

In debt equation (3), the results from 2SLS panel system are totally consistent with our prior univariate panel OLS results. Indeed, the relation between family ownership and debt levels remains non-linear when we use a model of simultaneous equations. All of the exogenous variables (with the exception of the operational risk RISK_EBITDA) are significant and have the same previous signs.

INSERT HERE TABLE 8

3.2 The Influence of Outside Shareholders

We analyzed the effect of an outside blockholder in the relationship between controlling shareholders' ownership and firm leverage. We used a dummy variable, *BLOC_EXT*, to identify an outside blockholder, defined as an entity holding at least 10% of a firm's shares that is not related to the controlling group. Other large blockholders may have strong incentives to monitor the controlling shareholders by keeping them from expropriating outside shareholders (La Porta et al., 1999). To consider what effect the presence of a second large shareholder has on our results, we re-estimate the regressions of Table 7, this time including outside blockholders as a dummy variable.

The coefficient of the *PERC_CAP* and the *PERC_CAPSQ* variables is still the same. In each of these regressions, the coefficient of the *BLOC_EXT* variable is not statistically significant. This result suggests that the presence of an outside blockholder has no effect on the firm's debt financing decisions. It does not interfere in the relationship regarding self-regulation over leverage levels or in the nonlinearity of the relationship between controlling shareholders' ownership and debt levels. Our results are consistent with the findings of Anderson and Reeb (2003) and Maury and Pajuste (2002), which disagree with the argument for a positive monitoring role by an outside shareholder. One potential explanation of our results is that an outside blockholder may have incentives to collude with the controlling shareholders to share the private benefits of control (Faccio and Lang, 2001). From Table 9, it is confirmed that the relation between controlling shareholders' ownership and firm leverage is non-linear. Thus, our results are robust after controlling for outside blockholders.

INSERT TABLE 9 HERE

CONCLUSION

This article examines the relationship between ownership structure and debt policy. Using a sample of 112 French listed firms over the period 1998-2009, our results indicate a non-linear, inverted-U-shaped relationship between the level of controlling shareholders' ownership and leverage. Endogeneity was taken into account in the empirical test with a system of simultaneous equations. Our findings are similar to those reported by Ellul (2008) and to the non-linear relationship found by Agca and Mansi (2008).

Controlling shareholders' ownership affects indebtedness in different ways. At low levels of controlling shareholders' ownership, the entrenchment effect dominates and results in a positive relation between controlling shareholders' ownership and leverage. This suggests that controlling shareholders holding a small fraction of a firm's equity will use more debt to inflate their power and protect themselves. When controlling shareholders' ownership reaches a certain point, controlling shareholders' objectives further converge with those of outside shareholders. Thus, the fear of financial distress will prompt controlling shareholders to lower indebtedness. This raises questions on how the ownership structure influences a firm's financing decisions in French listed firms. The behavior of the banker, which was considered to be passive in our setting, can be investigated in a more dynamic framework in the future.

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Annex. Definition of Variables

Variable	Definition	Measure
DT_TA	Book value	Book value of total debt divided by total assets
DT_CE	Book value of debt	Book value of total debt divided by the book value of total debt plus the book value of total equity.
DTCMV	Market value of debt	Book value of total debt divided by the book value of total debt plus the market value of total equity.
PERC_CAP	Controlling shareholder ownership	Proportion of cash flow rights held by controlling shareholders.
BLOC_EXT	Another large shareholder present	Dummy variable equals 1 if the second largest shareholder hold 10% and more of the voting rights; 0 otherwise.
PERC_VOTE	Controlling shareholder voting rights	Proportion of voting rights held by controlling shareholders
NDTS	Non debt tax shield	Ratio of depreciation to total assets.
WEDGE	Gap between cash flow and voting rights held by the controlling shareholder	Ratio of cash flow rights over voting rights
EBITDA_TA	Profitability before depreciation	Ratio of EBITDA to total assets.
EBIT_TA	Profitability after depreciation	Ratio of EBIT to total assets.
RISK_EBITDA	Operational Risk	Standard deviation of firm's EBITDA_TA over the 4 previous years
RISK_EBIT	Operational Risk	The standard deviation of firm's EBIT_TA over the 4 previous years
LOGTA	Firm Size	Logarithm of the book value of total assets.
FIXED_ASS_TA	Collaterals	Ratio of tangible fixed assets (Property, plant and equipment) to total assets.
MATU_DEBT	Debt maturity	Ratio of long term (above 1 year) financial debt to total financial debt
MTB	Growth opportunities	Ratio of market value of equity to equity book value.
TYPE_CONT	Type of control	Integer: (0) Dispersed ownership, (1) minor (below 40%) controller, (2) major controller (above (40%)
IDENT_CONT	Identity of the controller	Integer: (3) Family, (2) corporate, (1) Government, (0) financial institution
INTANGIBLE_TA	Intangible, know-how and R&D	Ratio of intangible assets over total assets
INDUST	Industry	Dummy variable equals 1 if the firm

		belongs to industry; 0 otherwise.
CONS_GOODS	consumer goods	Dummy variable equals 1 if the firm belongs to consumer goods; 0 otherwise.
SERV	Services	Dummy variable equals 1 if the firm belongs to services; 0 otherwise.
TECH_INFO	New technologies	Dummy variable equals 1 if the firm belongs to new technologies; 0 otherwise.

TABLE 1. Sample Description.

Characteristics of firms over the period 1998-2009. The sample consists of 112 French listed firm SBF 250 index after eliminating large cap and financial firms, % is total of available firm-year observations available over the total panel.

	N (firm-year observations)	Proportion (%)
Panel A. Type of control		
Widely held	146	10.9
Controlling minority shareholders	262	19.5
Controlling majority shareholders	835	62.1
Total	1233	
Panel B. Identity of controlling shareholders		
Financial institutions	40	3.0
Government	27	2.0
Corporations	333	24.8
Family	586	43.6
Total	986	
Panel C. Second large shareholder		
Second large shareholder is present	97	21.6
Second large shareholder is not present	352	78.4
Total	449	
Panel D. Sector data		
Industry	312	24.2
Cons goods and Trade	289	22.5
Services	435	33.8
Information Technology	251	19.5
Total	1287	

TABLE 2. Summary statistics of Ownership

(See Annex 1 for variable definitions; *DT_CE* and *DT_CMV* have been filtered out to eliminate negative values and outliers)

PanelA. Ownership			
	Mean	Std. deviation	N
PER_CAP	0.515	0.237	1212
PERC_VOTE	0.611	0.196	370
WEDGE	0.899	0.199	370
Panel B. Ownership frequency			
	N	%	
PERC_CAP<20%	139	11.5	
20%<PERC_CAP<40%	239	19.7	
40%<PERC_CAP<50%	144	11.9	
50%<PERC_CAP<60%	178	14.7	
60%<PERC_CAP<70%	218	18.0	
70%<PERC_CAP<80%	187	15.4	
PERC_CAP>80%	108	8.9	
Panel C Debt Leverage			
	Mean	Std. deviation	N
DT_TA	0.220	0.152	1217
DT_CE	0.367	0.230	1201
DT_CMV	0.272	0.222	1201

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TABLE 3. Univariate test of leverage levels in sub-samples

DT_TA: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, p-value is probability of significant difference between values of the variables

Debt leverage	Majority control	Minority control	p-value	Family	Corporate	p-value
DT_TA	0.212	0.248	0.15	0.197	0.226	0.00
DT_CE	0.361	0.386	0.12	0.336	0.383	0.00
DT_CMV	0.267	0.281	0.35	0.243	0.287	0.00

TABLE 4. Leverage levels based on the level of controlling shareholders ownership.
This table provides leverage levels in the sample firms based on the level of controlling shareholders ownership. *PERC_CAP* represents the fraction equity holdings of controlling shareholder, *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value.

Controlling shareholders ownership	*DT_TA*	*DT_CE*	*DT_CMV*
PERC_CAP<20%	0.255	0.370	0.285
20%<PERC_CAP<40%	0.234	0.397	0.293
40%<PERC_CAP<50%	0.209	0.365	0.234
50%<PERC_CAP<60%	0.254	0.425	0.327
60%<PERC_CAP<70%	0.195	0.330	0.244
70%<PERC_CAP<80%	0.217	0.372	0.292
PERC_CAP>80%	0.155	0.251	0.185

TABLE 5. Leverage and controlling shareholders' ownership

The table presents panel estimates of models relating debt ratios to controlling shareholders ownership. The sample contains 112 French listed firms over the period 1998-2009. *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, *PERC_CAP*: proportion of cash flow rights held by controlling shareholder, *NDTS*: ratio of depreciation to total assets. *EBITDA_TA*: ratio of EBITDA to total assets, LOGTA: logarithm of the book value of total assets, *RISK_EBITDA*: standard deviation of firm's profitability, *FIXED_ASS_TA*: ratio of fixed assets to total assets, *MTB*: market value of shares divided by equity book value. Sector dummy variable defined by *FTSE* classification are included into regressions but are not reported here, panel is estimated using individual effect only, p-values are between parentheses, a, b, c indicates significance at the 1% level, 5% level and 10% level. The Hausman test compares random individual effects to fixed individual effects.

	Dependant variable		
Independent variable	*DT_TA*	*DT_CE*	*DT_CMV*
Model	M1	M2	M3
PERC_CAP	-0.0299	-0.0322	-0.0291
	(0.12)	(0.28)	(0.35)
MTB	0.0020	0.0044	-0.0027
	(0.00)a	(0.00)a	(0.00)a
LOGTA	0.1255	0.1653	0.1761
	(0.00)a	(0.00)a	(0.00)a
FIXED_ASS_TA	0.1781	0.1807	0.1369
	(0.00)a	(0.00)a	(0.06)b
EBITDA_TA	-0.3260	-0.5475	-0.6811
	(0.00)a	(0.00)a	(0.00)a
NDTS	0.2242	0.3146	0.4999
	(0.00)	(0.01)a	(0.00)a
RISK_EBITDA	0.1540	0.4038	0.1281
	(0.11)	(0.00)a	(0.41)
Dummy sector	Sign	Sign	Sign
R^2	0.79	0.80	0.75
Hausman Test	0.00	0.00	0
(fixed/random effect)	(1.00)	(1.00)	(1.00)
N	1057	1050	1055

TABLE 6. Regression results on the relationship between leverage and controlling shareholders' ownership by type of control.

The table presents panel estimates of models relating debt ratios to controlling shareholders ownership. Panel are estimated through two sub-samples of major controlling shareholder with a stake of capital above 40% and minor controlling blockholder holding a stake of capital below 40%. The sample contains 112 French listed firms over the period 1998-2009. *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, *PERC_CAP*: proportion of cash flow rights held by controlling shareholder, *NDTS*: ratio of depreciation to total assets. *EBITDA_TA*: ratio of EBITDA to total assets, LOGTA: logarithm of the book value of total assets, *RISK_EBITDA*: standard deviation of firm's profitability, *FIXED_ASS_TA*: ratio of fixed assets to total assets, *MTB*: market value of shares divided by equity book value. Sector dummy variable defined by *FTSE* classification are included into regressions but are not reported here, panel is estimated using individual effect only, p-values are between parentheses, a, b, c indicates significance at the 1% level, 5% level and 10% level.

Independent variables	Dependant variable					
	Type of control					
	Controlling majority shareholders			Controlling minority shareholders		
Model	M4	M5	M6	M7	M8	M9
	DT_TA	*DT_CE*	*DT_CMV*	*DT_TA*	*DT_CE*	*DT_CMV*
PERC_CAP	-0.1505	-0.2561	-0.2526	-0.1082	-0.0871	-0.1412
	(0.00)a	(0.00)a	(0.00)a	(0.15)	(0.45)	(0.29)
MTB	0.0067	0.0153	-0.0163	0.0015	0.0031	-0.0013
	(0.00)a	(0.00)a	(0.00)a	(0.00)a	(0.00)a	(0.12)
LOGTA	0.1297	0.1911	0.1497	0.1130	0.1737	0.1570
	(0.00)a	(0.00)a	(0.00)a	(0.00)a	(0.00)a	(0.00)a
FIXED_ASS_TA	0.1686	0.1453	0.0784	0.0419	-0.0237	0.1720
	(0.00)a	(0.00)a	(0.28)	(0.77)	(0.90)	(0.36)
EBITDA_TA	-0.4813	-0.7427	-0.8604	-0.2084	-0.4691	-0.2829
	(0.00)a	(0.00)a	(0.00)a	(0.03)b	(0.00)a	(0.09)c
NDTS	0.6541	1.0372	1.0897	-0.2226	-0.2898	-0.0651
	(0.00)a	(0.00)a	(0.00)a	(0.03)b	(0.07)c	(0.73)a
RISK_EBITDA	0.0892	0.4275	0.0642	-0.1035	-0.0653	0.3156
	(0.39)	(0.01)a	(0.71)	(0.65)	(0.84)	(0.42)
Dummy sector	Non Sign	Non Sign	Non Sign	Non Sign	Non Sign	Non Sign
R^2	0.85	0.85	0.82	0.80	0.79	0.64
N	750	749	748	213	213	213

Table 7.The non-linear relationship between controlling shareholders' ownership and debt levels

The table presents panel estimates of models relating debt ratios to controlling shareholders ownership. The sample contains 112 French listed firms over the period 1998-2009. *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, *PERC_CAP*: proportion of cash flow rights held by controlling shareholder, *PERC_CAPSQ*: squared value of *PERC_CAP*, *NDTS*: ratio of depreciation to total assets. *EBITDA_TA*: ratio of EBITDA to total assets, LOGTA: logarithm of the book value of total assets, *RISK_EBITDA*: standard deviation of firm's profitability, *FIXED_ASS_TA*: ratio of fixed assets to total assets, *MTB*: market value of shares divided by equity book value. Sector dummy variable defined by *FTSE* classification are included into regressions but are not reported here, panel is estimated using individual effect only, p-values are between parentheses, a, b, c indicates significance at the 1% level, 5% level and 10% level.

Independent variables	Dependent variable		
Model	M10	M11	M12
	DT_TA	*DT_CE*	*DT_CMV*
PERC_CAP	0.1783	0.5242	0.3994
	(0.00)a	(0.00)a	(0.00)a
PERC_CAPSQ	-0.2078	-0.5526	-0.4281
	(0.00)a	(0.00)a	(0.00)a
MTB	0.0020	0.0044	-0.0028
	(0.00)a	(0.00)a	(0.00)a
LOGTA	0.1321	0.1812	0.1872
	(0.00)a	(0.00)a	(0.00)a
FIXED_ASS_TA	0.1757	0.1845	0.1339
	(0.00)a	(0.00)a	(0.06)c
EBITDA_TA	-0.3299	-0.5566	-0.6932
	(0.00)a	(0.00)a	(0.00)a
NDTS	0.2265	0.2547	0.5036
	(0.00)a	(0.03)b	(0.00)b
RISK_EBITDA	0.1680	0.4346	0.1545
	(0.00)a	(0.00)a	(0.32)a
Dummy sector	Sign	Sign	Sign
R^2	0.80	0.81	0.76
N	1057	1050	1055
Inflection point (%)	42.9	50.1	46.6

TABLE 8. Simultaneous equation system between controlling shareholders' ownership and debt leverage.

The table presents the results of a simultaneous panel equations system between leverage and controlling shareholder ownership using 2SLS regression. The sample contains 112 French listed firms over the period 1998-2009. The sample contains 112 French listed firms over the period 1998-2009. *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, *PERC_CAP*: proportion of cash flow rights held by controlling shareholder, *PERC_CAPSQ*: squared value of *PERC_CAP*, *NDTS*: ratio of depreciation to total assets. *EBITDA_TA*: ratio of EBITDA to total assets, LOGTA: logarithm of the book value of total assets, *RISK_EBITDA*: standard deviation of firm's profitability, *FIXED_ASS_TA*: ratio of fixed assets to total assets, *MTB*: market value of shares divided by equity book value. Sector dummy variable defined by *FTSE* classification are included into regressions but are not reported here, *DT(k)* for k=1,2, 3 is alternatively *DT_TA*, *DT_CE* and *DT_CMV*, *INTANGIBLE_TA*: ratio of intangible assets to total assets, *RISK_EBIT*: Standard deviation of *EBIT* considered as a proxy of operational risk for shareholders, *MAT_DEBT*: share of long term debt in the total financial debt, *C_FAM*: dummy for family ownership and control, panel is estimated using individual effect only, p-values are between parentheses, a, b, c indicates significance at the 1% level, 5% level and 10% level.

	DT_TA	*PERC_CAP*	*DT_CE*	*PERC_CAP*	*DT_CMV*	*PERC_CAP*
Model	S_1		S_2		S_3	
PERC_CAP	0.2165		0.6959		0.6107	
	(0.00)a		(0.00)a		(0.00)a	
PERC_CAPSQ	-0.3260		-0.8006		-0.6462	
	(0.00)a		(0.00)a		(0.00)a	
MTB	0.0016	-0.0012	0.0046	-0.0015	-0.0026	-0.0015
	(0.02)b	(0.28)	(0.00)a	(0.20)	(0.01)a	(0.20)
LOGTA	0.0466	-0.0082	0.1214	-0.0010	0.1217	-0.0013
	(0.00)a	(0.49)	(0.00)a	(0.93)	(0.00)a	(0.29)
FIXED_ASS_TA	0.1289		0.0679		0.1864	
	(0.00)a		(0.13)		(0.00)a	
EBITDA_TA	-0.4285		-0.8250		-0.9697	
	(0.00)a		(0.00)a		(0.00)a	
NDTS	0.6129		0.6975		0.8577	
	(0.00)a		(0.00)a		(0.00)a	
RISK_EBITDA	-0.1944		-0.0965		0.0299	
	(0.19)		(0.66)		(0.82)	
Dummy sector	Sign	Sign	Non Sign	Sign	Sign	Sign
DT(k)		-0.1669		-0.0773		-0.0127
		(0.00)a		(0.02)b		(0.71)
INTANGIBLE_TA		-0.1873		-0.2062		-0.2052
		(0.00)a		(0.00)a		(0.00)a
RISK_EBIT		-0.3352		-0.2819		-0.3438
		(0.06)c		(0.12)		(0.06)c
MAT_DEBT		-0.0155		-0.0137		-0.0219
		(0.55)		(0.58)		(0.39)
C_FAM		0.1306		0.1333		0.1340
		(0.00)a		(0.00)a		(0.00)a
R^2	0.17	0.18	0.25	0.19	0.33	0.19
N	1052		1045		1050	
Inflection point (%)	33.2		43.4		47.2	

Table 9. Non-linear relationship and outside blockholders

The table presents panel estimates of models relating debt ratios to controlling shareholders ownership. The sample contains 112 French listed firms over the period 1998-2009. *DT_TA*: ratio of financial debt over total assets, *DT_CE*: ratio of financial debt divide by total employed capital using book value; *DT_CMV*: ratio of financial debt divided by total debt and equity capital using stock market value, *PERC_CAP*: proportion of cash flow rights held by controlling shareholder, *PERC_CAPSQ*: squared value of *PERC_CAP*, *NDTS*: ratio of depreciation to total assets. *EBITDA_TA*: ratio of EBITDA to total assets, LOGTA: logarithm of the book value of total assets, *RISK_EBITDA*: standard deviation of firm's profitability, *FIXED_ASS_TA*: ratio of fixed assets to total assets, *MTB*: market value of shares divided by equity book value, *BLOC_EXT*: dummy variable for the presence of an outside investor holding more than 10% of the capital. Sector dummy variable defined by *FTSE* classification are included into regressions but are not reported here, panel is estimated using individual effect only, p-values are between parentheses, a, b, c indicates significance at the 1% level, 5% level and 10% level.

Independent variables	Dependent variable		
Model	M13	M14	M15
	DT_TA	*DT_CE*	*DT_CMV*
PERC_CAP	0.2075	0.4681	0.4389
	(0.00)a	(0.00)a	(0.00)a
PERC_CAPSQ	-0.2363	-0.5270	-0.4849
	(0.00)a	(0.00)a	(0.00)a
MTB	0.0064	0.0137	-0.0209
	(0.00)a	(0.00)a	(0.00)a
LOGTA	0.1502	0.1992	0.1445
	(0.00)a	(0.00)a	(0.00)a
FIXED_ASS_TA	0.1987	0.2353	0.1680
	(0.00)a	(0.00)a	(0.02)b
EBITDA_TA	-0.3525	-0.5646	-0.5885
	(0.00)a	(0.00)a	(0.00)a
NDTS	0.2349	0.1859	0.2666
	(0.00)a	(0.03)b	(0.02)b
RISK_EBITDA	-0.0066	0.1685	-0.0688
	(0.95)	(0.32)	(0.70)
BLOC_EXT	0.0021	-0.0254	-0.0236
	(0.95)	(0.61)	(0.54)
Dummy sector	Sign	Sign	Sign
R^2	0.80	0.81	0.77
N	873	871	871

[1] This paper benefited from comments of J. Caby and F. Derrien. It was presented at the HEC Geneva seminar of Finance, at the 2007 AFFI International Finance Meeting in Paris, at the 2008 SFA Annual Conference.

[2] These are developed mainly in the US context.

[3] French regulation identifies 40% of voting rights as a cut-off level to presume control.

[4] We checked using the Hausman test that random effects should be used.

[5] Cronqvist and Nilsson (2003) document that controlling minority shareholders (CMSs) have control of a firm's votes while owning only a minority of the cash flow rights. p.695

[6] Many recent studies show that controlling shareholders rely more heavily on debt financing when the deviation of their control rights from cash flow rights is large (Paligorova and Xu, 2009; Ellul, 2008; King and Santor, 2008; Manos et al., 2007; Boubaker, 2007, Bianco and Nicodono, 2006, Faccio and Lang, 2002).